ODP-0-026
9 JAN 1989

MEMORANDUM FOR: Chairman, Agency Energy Committee,
Office of Logistics

STATINTL FROM : [redacted]
ODP Member, Agency Energy Committee

SUBJECT : Use of Heat Generated by Computers

1. The subject "Use of Heat Generated by Computers" is one of the topics to be discussed during the 16 January meeting of the Agency Energy Committee. Members of ODP have been involved in discussions on this topic during the past few months at various meetings of computer pro-
STATINTL fessionals, such as GUIDE meetings.

2. Attached is a letter that was received by Mr. [redacted] after one such discussion. The letter is forwarded to you so that it may be used as a basis of the Committee discussion on the 16th.

STAT [redacted]

Chief, Management Staff, ODP

Attachment: a/s

STATINTL cc: [redacted]

JL 0 0119

Hassett Associates

MANAGEMENT CONSULTANTS

August 28, 1978

NTL

[redacted]
CIA Headquarters
Room GD45
Washington, D.C. 20505

Good morning Steve!

As a followup to our discussion at GUIDE 46.5, here is an outline of some of the alternatives which might be used to save energy and operating dollars for your data center.

I recall that you said that your actual data center was 80,000 square feet in a building of 240,000 square feet. The cooling source was from a chilled water plant.

In general, the ways to save energy in a data center include:

1. Keep the ventilation air quantity to an absolute minimum, no more than 1% of the air in circulation. This will save money by reducing the cost of cooling/dehumidifying and humidifying. The cost of humidifying is usually very expensive.

2. In a chilled water plant, maintain the water temperature to the air handlers at whatever temperature will do minimum dehumidifying. This will often be 47-49 degrees in the summer up to 50-52 degrees in the winter.

   The chilled water source should be dedicated to the data center and not be part of the total building system. It is easier to control the water temperature with a dedicated system; otherwise a secondary piping loop and control will be necessary.

   Many data centers with chilled water run at too low a water temperature, resulting in excess dehumidification. The cost of re-humidifying is then enormous with today's cost of energy and with the prospects of continued increase.

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3. In a data center as large as yours, I would make sure that the reheat coils will not energize. Some control systems, if they are too sensitive, will call for reheat whenever the humidistat calls for dehumidifying only.

   While I doubt that dehumidifying-only occurs in your large center, maladjusted controls could be costing an absolute fortune in turning on the reheat coil unnecessarily. If there were no reheat coils at all in the room, the hardware adds enough heat to serve the function of the rehe coils.

4. Heat Recovery is one of the great ways to save energy by using the heat rejected from the data center computer facilities to heat other areas of the same building in the winter.

   Rejected heat, in the form af warm water or glycol can be used for:

   a. Preheating domestic hot water,
   b. Preheating ventilation air for the comfort system,
   c. Reheating recirculated air for the comfort system,
   d. Heating a water storage system, or
   e. Ice and snow melting, or a combination of the above.

   How much money is this worth? If you could save <u>all</u> the heat rejected all year, what would be the total savings in <u>ten</u> years if the electric rate doubled during that period. (And there is every likelyhood that it will).

   Assuming a cooling load of 800 tons, the heat rejection is approximately (800 x 15000B/hr) or 12,000 MBh whichiis equivalent to (12,000 MBh/ 3.4) 3529 kw. This kw operating for 8760 hours equals 30,917,640 kw-hr. At an electric rate of $.04 today and $.08 in ten years, or an average of $.06, the ten year cost savings would be 30,917,640 kw-hr x $.06 x 10 years = $18 million!

   It is rare that the heat rejection can be used all year, but the possible savings is so great that one must look at the possible opportunities. Your consulting engineer can quickly give you an idea of the alternatives.

There are some variations on the heat recovery that might be considered:

a. Because normal chilled water heat rejection is through water cooled condensers that can operate with leaving water temperatures of 95 to 105 degrees, the devices that use this low water temperature for heating must be larger than if the water temperature were much higher, such as 140 to 180 degrees.

   One alternative is to use a 'cascade' centrifugal water chiller which has a leaving condenser water temperature in this range.

b. Another alternative is to use in-room direct expansio systems that reject their heat directly to glycol which can be used for heating since the temperature level is a useful 120 degrees.

5. Another energy conservation component is the evaporative panel humidifier, which is non-electric and saves a dramatic amount of money because it does not use the high energy associated with boiling water to steam, and the evaporative pad has a cooling effect on the air stream of about 16,000 Bth/hr for every 20 tons of system capacity.

I have this suggestion for you: Before you talk to anyone else in your Department or Agency, contact Mr. Lloyd Stiegman of Airpac Systems at (703) 938-2604. He is one of the most knowledgeable men in the industry and has done most of the data center process cooling throughout Government systems.

Ask him to bring with him, engineering brochures and reports which cover the savings expected with a) heat recovery, b) reheat c) evaporative pad humidifiers and d) cooling directly with glycol during low outdoor temperatures. His input to your report will be more specific since he is familiar with local installations and with the workings of GSA and the consulting engineering community.

If I can be of any further help to you, please call me.

Cordially,

Jim Hassett

JAMES E. HASSETT
President

MEMORANDUM FOR: Chief, Plans and Programs Staff, OL

STATINTL FROM: [redacted]
Deputy Chief, Real Estate and Construction
Division, OL

SUBJECT: Comments on Hassett Associates' letter to
STATINTL [redacted] dated August 28, 1978

1. The percentage of makeup air, although unknown, is already minimized. Air is recirculated through fan coil units, most of which are located in the cooled areas.

2. The chilled water is obtained from a central plant except when operating under abnormal or emergency conditions. Significant amounts of equipment are cooled by water rather than room ambient air. Alarms are established to warn when chilled water temperatures engage in excursions outside of fairly tight limits. It may be possible to perform limited adjustments, but if some margin of safety is not maintained, the reaction time is cut below acceptable levels of practicality.

3. Heat recovery at the condensers is an attractive possibility, but unfortunately, with the exception of emergency equipment, is complicated by the geographical separation of the power plant from the main building.

4. Of all the humidifying equipment utilized, the only effective and maintainable system found successful thus far are those which introduce steam directly from the power plant. Many have been tried--all claimed to be great by the designer, or the manufacturer, or both.

STATINTL [redacted]